REMARKS

Favorable reconsideration of this application, in view of the present amendment and in light of the following discussion, is respectfully requested.

Claims 1, 2, 4-10, 12-17, 19 and 20 are currently pending, with Claims 6-10 being withdrawn from consideration as directed to a non-elected invention. Claims 3 and 18 have been canceled without prejudice or disclaimer; Claim 1 has been amended; and Claims 19 and 20 have been added by the present amendment. The changes and additions to the claims are supported by the originally filed specification and do not add new matter.[1]

In the outstanding Office Action, Claim 14 was rejected under 35 U.S.C. § 112, second paragraph; Claims 1, 2, 4, 12, 15, and 18 were rejected under 35 U.S.C. § 103(a) as unpatentable over Ryusuke et al. (Japanese Patent Publication No. 05-009740, hereinafter "Ryusuke") in view of Grosshart (U.S. Patent No. 5,948,283), Kobayashi et al. (U.S. Patent No. 5,470,451, hereinafter "Kobayashi"), Kim (U.S. Patent No. 5,983,998), and Nguyen (U.S. Publication No. 2002/0011216); Claim 5 was rejected under 35 U.S.C. § 103(a) as unpatentable over Ryusuke in view of Grosshart, Kobayashi, Kim, and Nguyen, and further in view of Otsuki (U.S. Publication No. 2001/0003271); Claim 3 was rejected under 35 U.S.C. § 103(a) as unpatentable over Ryusuke in view of Grosshart, Kobayashi, Kim, and Nguyen, and further in view of Kazama et al. (U.S. Patent No. 5,567,267, hereinafter "Kazama"); Claims 16 and 17 were rejected under 35 U.S.C. § 103(a) as unpatentable over Ryusuke in view of Grosshart, Kobayashi, Kim, and Nguyen, and further in view of Burger et al. (U.S. Patent No. 4,143,523, hereinafter "Burger"); Claim 13 was rejected under 35 U.S.C. § 103(a) as unpatentable over Ryusuke in view of Grosshart, Kobayashi, Kim, and Nguyen, further in view of Byrd (U.S. Patent No. 3,537,515); and Claim 14 was rejected under 35 U.S.C. § 103(a) as unpatentable over Ryusuke in view of Grosshart, Kobayashi, Kim,

[1] See, *e.g.*, page 19, lines 9-12, page 10, lines 4-12, and page 11, lines 18-22 of Applicants' specification; also see Figure 1.

Nguyen, and Byrd, and further in view of Mundlinger et al. (U.S. Patent No. 5,453,641, hereinafter "Mundlinger").

Initially, Applicants note that the rejection of Claim 14 under 35 U.S.C. § 112, second paragraph, was indicated as being overcome in the Advisory Action dated May 21, 2008.

Amended Claim 1 is directed to a substrate processing apparatus comprising:

> a processing chamber for accommodating a substrate therein;
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> a mounting table for mounting the substrate thereon;
>
> a heating member disposed in the mounting table, for heating the substrate;
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> a sealing member disposed between a bottom of a support of the mounting table and a bottom portion of the processing chamber;
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> a cooling unit, having a cooling medium, for cooling the sealing member by using a latent heat of vaporization of the cooling medium included therein, wherein the cooling unit includes an airtight casing for accommodating the cooling medium therein, the casing has a first end portion and a second end portion, and the first end portion is inserted into an opening formed through the bottom portion of the processing chamber;
>
> a temperature sensor inserted into an aperture formed through the bottom portion of the processing chamber near the sealing member; and
>
> a cooling unit controller for controlling the cooling unit based on a measurement result of the temperature sensor,
>
> wherein the cooling unit further includes a condenser accommodating therein the second end portion to thereby liquefy, in the second end portion, the cooling medium vaporized in the first end portion.

Regarding the rejection of Claim 1 under 35 U.S.C. § 103(a), the substrate processing apparatus, as defined in amended Claim 1, includes a sealing member disposed between a bottom of a support of the mounting table and a bottom portion of the processing chamber and a cooling unit. In particular, the cooling unit has a cooling medium, for cooling the sealing member **by using a latent heat of vaporization of the cooling medium included**

therein. Specifically, in order to use a latent heat of vaporization of the cooling medium, the cooling unit includes an airtight casing for accommodating the cooling medium therein, the casing has a first and a second end portion, and the first end portion is inserted into an opening formed through the bottom portion of the processing chamber.

The cooling unit further includes a condenser which accommodates therein the second end portion. In this configuration, the liquefied cooling medium accommodated in the first end portion vaporizes by absorbing heat around the sealing member. The vaporized cooling medium is then transferred to the second end portion and is cooled down by the condenser, thereby being liquefied again. Then, the liquefied cooling medium is transferred to the first end portion again. By repetition of this cycle, even though the film forming apparatus is miniaturized and thus, the distance between the susceptor and the chamber is shortened, the sealing member is cooled so that a rise of temperature of the sealing member is suppressed.

Further, the cooling unit recited in Claim 1, which carries out a cooling operation by using latent heat of vaporization can provide a much higher cooling power than that of the water cooled jacket which performs a cooling operation by way of circulating a cooling medium. Moreover, when using the water cooled jacket, air bubbles may be generated in a tube as water therein vaporizes, resulting in the expansion of the tube. In contrast, in the cooling unit recited in Claim 1, expansion of the airtight casing can be avoided even with the vaporization of the cooling medium taking place at the first end portion because the cooling medium is liquefied at the second end portion. The cooling unit further includes **a temperature sensor inserted into an aperture formed through the bottom portion of the processing chamber near the sealing member**. It is respectfully submitted that the cited references do not disclose or suggest every feature recited in amended Claim 1.

Ryusuke is directed to a semiconductor wafer heating device. In particular, Ryusuke describes a heating apparatus including a top face of a case 14 which is covered by a flange

15 having a water cooled jacket 16 formed therein.[2] As described above, the water cooled jacket 16 described in Ryusuke performs a cooling operation **by way of circulating a cooling medium**, and ***not*** by using latent heat of vaporization. Further, the Office Action concedes on page 4 that Ryusuke does not teach the cooling unit recited in amended Claim 1. Instead, the Office Action relies on Grosshart and Kim as describing the claimed cooling unit.

Grosshart is directed to a method and apparatus for enhancing outcome uniformity of direct-plasma processes. In particular, the Office Action asserts that Grosshart "teaches the use of refrigeration sources for achieving steady-state thermal environment."[3] However, it is noted that Grosshart describes that "the substrate support includes a fluid that circulates at a constant rate through the support"[4] and "[w]ater leaving the electrode 16 passes through the conduit 85 and enters the heat exchanger 70, which adjusts the temperature of the water entering conduit 90 to a constant value."[5] That is, **Grosshart simply teaches the use of a cooling unit which performs a cooling operation by way of circulating a cooling medium in a plasma processing apparatus**. Grosshart does not teach or suggest using latent heat of vaporization in a plasma processing apparatus.

Kim is directed to a pipe arrangement in an evaporator of an air conditioner. In particular, the Office Action asserts that Kim "teaches the well-known details of refrigeration such as the cooling unit (Fig. 1)."[6] However, it is noted that Kim discusses an ordinary air conditioner for maintaining optimum temperature conditions in a room using refrigeration sources.[7] Kim does not teach or suggest using latent heat of vaporization in a plasma processing apparatus.

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[2] See Ryusuke, at paragraph [0005] and in Figure 8.
[3] See Office Action dated January 22, 2008, page 4.
[4] See Grosshart, at column 2, lines 8 and 9.
[5] Id. at column 6, lines 18-21.
[6] See Office Action dated January 22, 2008, page 5.
[7] See Kim, at column 1, lines 11-15.

Nguyen is directed to an integral susceptor-wall reactor system and method. In particular, the Office Action asserts that Nguyen teaches "measurement of wall temperature with an embedded thermocouple (Figs. 2 and 7 and [0060]) to protect the O-ring 516 by cooling mechanism (Fig. 7 and [0065],"[8] which corresponds to the temperature sensor now recited in Claim 1.

However, if a substrate processing apparatus has both a heating member and a sealing member disposed near the heating member, it is very difficult for the substrate processing apparatus to maintain a proper temperature in the processing chamber so as to protect the sealing member and to prevent deposits from adhering to the processing chamber or a substrate. According to amended Claim 1, **a temperature sensor is inserted into an aperture formed through the bottom portion of the processing chamber near the sealing member**. Thus, the substrate processing apparatus can obtain an exact value of the temperature of the sealing member and thus, the temperature can be properly controlled based on the exact value.

In contrast, Nguyen does not teach or suggest that **a temperature sensor is inserted into an aperture formed through the bottom portion of the processing chamber near the sealing member**. Instead, Nguyen simply discusses that a substrate temperature is measured with an embedded thermocouple (corresponding to the temperature sensor of Claim 1). Nguyen is silent as to the position of the embedded thermocouple in the processing chamber. Since the temperature of the processing chamber varies depending on the position in the processing chamber, the position of the temperature sensor is very important. Accordingly, Nguyen does not teach or suggest that a temperature sensor is inserted into an aperture formed through the bottom portion of the processing chamber near the sealing member.

[8] See Office Action dated January 22, 2008, page 8.

Additionally, it is respectfully submitted that Kobayashi fails to remedy the above-noted deficiencies of Ryusuke, Grosshart, Kim, and Nguyen. Further, the Office Action does note cite Kobayashi for teachings those deficiencies.

Therefore, it is respectfully submitted that a *prima facie* case of obviousness has not been made with respect to independent Claim 1. Accordingly, it is respectfully requested that the rejection of Claim 1, and all claims dependent thereon, as unpatentable over Ryusuke in view of Grosshart, Kobayashi, Kim, and Nguyen be withdrawn.

Turning now to the remaining rejections in the Office Action, Applicants respectfully submit that none of the remaining secondary references (Otsuki, Kazama, Burger, Byrd, and Mundlinger) cure the deficiencies noted above with respect to the combination of Ryusuke, Grosshart, Kim, Kobayashi, and Nguyen. Therefore, for at least the reasons discussed above, it is respectfully submitted that Claim 1, and all claims dependent thereon, patentably define over all of the cited references.

Thus, it is respectfully requested that independent Claim 1 (and all associated dependent claims) patentably define over any proper combination of the applied references.

Consequently, in view of the present amendment, no further issues are believed to be outstanding in the present application, and the present application is believed to be in condition for formal allowance. A Notice of Allowance is earnestly solicited.

Respectfully submitted,

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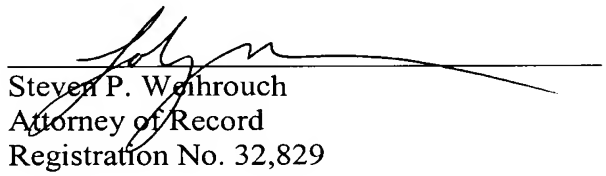

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